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Implementation of warning tool to improve maternal newborn health outcomes in a developing country

Sana Sheikh
Aga Khan University, sana.sheikh2@aku.edu

Rahat Qureshi
Aga Khan University, rahat.qureshi@aku.edu

Sidrah Nausheen
Aga Khan University

Rozina Sikandar Sultanali
Aga Khan University, rozina.sikandar@aku.edu

Implementation of warning tool to improve maternal newborn health outcomes in a developing country

Sana Sheikh, Rahat Qureshi, Sidrah Nausheen, Rozina Sikandar

Abstract

Objective: To improve health outcomes through the implementation of national early warning sign tool for babies delivered through emergency caesarean section in off-work hours.

Methods: This comparative clinical study was conducted at the Aga Khan Hospital for Women and Children, Karachi, from April to August 2014, and comprised women who had an emergency caesarean section. Maternal and perinatal outcomes were compared of patients in Group A and Group B which represented individuals before and after the implementation of the national early warning score respectively.

Results: Of the 200 participants, there were 100(50%) in each group. The overall mean age was 26.79±5.10 years. The mean age was 26.3±5 years in Group A, and 27.2±5 years in Group B (p=0.25). The two groups were also comparable in terms of parity (p=0.77) and co-morbidities (p =0.51). There was no stillbirth or maternal death, but decline in complications due to post-partum haemorrhage (p=0.00) was observed due to early recognition and timely management. None of the women required referral to higher facility.

Conclusion: National early warning score was found to be a practical early warning tool for obstetric population.

Keywords: Early warning tool, Maternal outcome, Emergency caesarean section. (JPMA 67: 111; 2017)

Introduction

It has been reported that in practice at times prior to acute deterioration and transfer of patient to intensive care, early signs of deterioration either remain unrecognised or not acted upon by nursing and medical staff,[1] even at health facilities with high standard of care. Chance of missing early signs of deteriorating patients is even higher in countries with limited health care resources. In Pakistan, there are only 0.8 physicians and 0.6 nurses available per 1,000 people.[2] Our country has maternal mortality ratio of 170/100,000 live births[2] but maternal mortality alone is not sufficient to depict the situation of maternal health.[3]

Obstetric near miss (ONM) is a term used for condition when due to life-threatening complication during pregnancy, labour or post-partum period a woman survives either because of medical intervention or merely by chance.[4] Siddiqui et al. reported ONM prevalence of 76/1,000 live births and near miss to mortality ratio of 5.8:1 in a study conducted in a teaching hospital in Pakistan. These estimates are very high compared to ONM and near miss to mortality ratio (7.1/1,000 live births; 118:1) of developed countries.[5,6] Maternal mortality to severe morbidity ratio may reflect the standard of maternal care provided at a health facility.[6]

A survey of health facilities in Pakistan by the World Health Organisation (WHO) reported high rate of near miss cases and maternal mortality despite availability of essential drugs to prevent these events. Findings of the survey suggested that delayed and incomplete assessment of patient's severity can be one of the reasons of these morbidities and mortalities.[7] To improve quality of care in settings where limited resources exist for assessment of patient's deterioration, there is need to have simple tools which can help to flag these patients and seek experts' help at an early stage.

Early warning scores (EWS), based on physiological observations, such as heart and respiratory rate etc., have been developed to facilitate early recognition of signs of deterioration and prompting nursing staff to request a medical review.[8] After the results of Confidential Enquiries into Maternal and Child Health (CEMACH), the use of warning tools for obstetrics population to improve maternal and perinatal outcome was recommended in the United Kingdom (UK).[9] With the support of Royal College of Physicians and Surgeons (Ireland), a National Early Warning Score (NEWS) was adopted to standardise the assessment of disease severity and communication to enable a more timely response across acute hospitals.[8]

Bedsides, tools like NEWS have been used in developed countries to improve patient care, but it is still a relatively new concept for developing countries.[9] This study was

Division of Women and Child Health, Department of Obstetrics and Gynaecology, Aga Khan University, Karachi, Pakistan.

Correspondence: Sana Sheikh. Email: docssshk@hotmail.com

planned to improve maternal and perinatal outcomes through implementation of NEWS for the management of obstetrics patients during off-work hours, i.e., from 1700 hours to 0800 hours, in a secondary-level hospital. Off-work hours were selected because even in hospitals with high standard of care, quality of care gets affected during these hours because of limited human resources and clinical experts.

Patients and Methods

This comparative clinical study was conducted at the Aga Khan Hospital for Women and Children, (AKHW&C), Karachi, from April to July 2014, and comprised women who had an emergency caesarean section (CS). Approval for the study was obtained from the ethics review committee of the Aga Khan University. The NEWS tool was tested in monitoring of obstetrics patients. The AKHW&C, located at Kharadar, is a 38-bed secondary-care facility established in 1924. It came under the aegis of the Aga Khan University in 2010. It offered in-house paediatric and obstetrics/gynaecology services 24/7. During off-work hours, consultant obstetrician, paediatricians and anaesthetist were not present on the floor; however, they came to the hospital on call in case of an emergency. NEWS was incorporated into the medical files of eligible obstetric patients. The nursing staff was responsible for monitoring patients undergoing emergency CS between 1700 hours and 0800 hours using NEWS.

Through NEWS, a patient's vital signs (blood pressure, pulse, respiratory rate, oxygen saturation, level of consciousness and blood sugar) were recorded and each vital sign was allocated a numerical score (from 0 to 3) on a colour-coded observation chart, where a score of 0 was most desirable and a score of 3 was least desirable. These scores were then aggregated and the total score was recorded which was their early warning score and could range from 0 to $\geq$ 7. The lower the aggregate, the lower the risk for a patient and vice versa. Based on the aggregated score, escalation plan for monitoring and management of patient was also provided. For example, if a patient's score was 0 then 12-hourly monitoring was required, whereas if score was $\geq$7 continuous monitoring, immediately informing specialist/consultant concerned and transfer to intensive care unit (ICU) were advised.

Several maternal and neonatal health outcomes were observed as indicators of improved clinical care of patients (Figure-1).

Prospective and retrospective review of medical records of all patients who had emergency C-section before (September-December 2013) and after (April-August 2014) the implementation of NEWS was conducted. We did not exclude any emergency CS done during the study duration. Patients who had CS before the implementation of NEWS constituted Group A and those who had it after the implementation constituted Group B. Maternal and perinatal outcomes of these patients were compared to assess the difference, if any, in patient's outcome.

Rate of maternal and neonatal outcomes 6 months before and after the implementation of NEWS was compared using Student's t-test, chi-square test and Fisher's exact test. $P<0.05$ was considered significant.

Results

Of the 535 deliveries conducted during the study period, 257(48%) occurred during off-work hours; of them 100(40%) involved emergency CS. Therefore, the total number of participants was 200, i.e. 100(50%) each in

Maternal Health Outcomes:

1. Number of patients transfer to high level of care 6 months before and after implementation of tools during off-working hours
2. Number of patients needed consultancy with specialist
3. Maternal complications (postpartum haemorrhage, need for blood transfusion, anaesthesia complications)
4. Number of maternal deaths

Neonatal Health Outcomes:

1. Number of babies transfer to high level of care 6 months before and after implementation of tools during off-working hours
2. APGAR score at 1 and 5 minutes
3. Number of babies transferred to NICU
4. Number of babies having birth injury
5. Number of neonatal deaths

Figure-1: List of maternal and neonatal health outcomes observed.

Apgar: Appearance, Pulse, Grimace, Activity, Respiration
NICU: Neonatal intensive care unit.

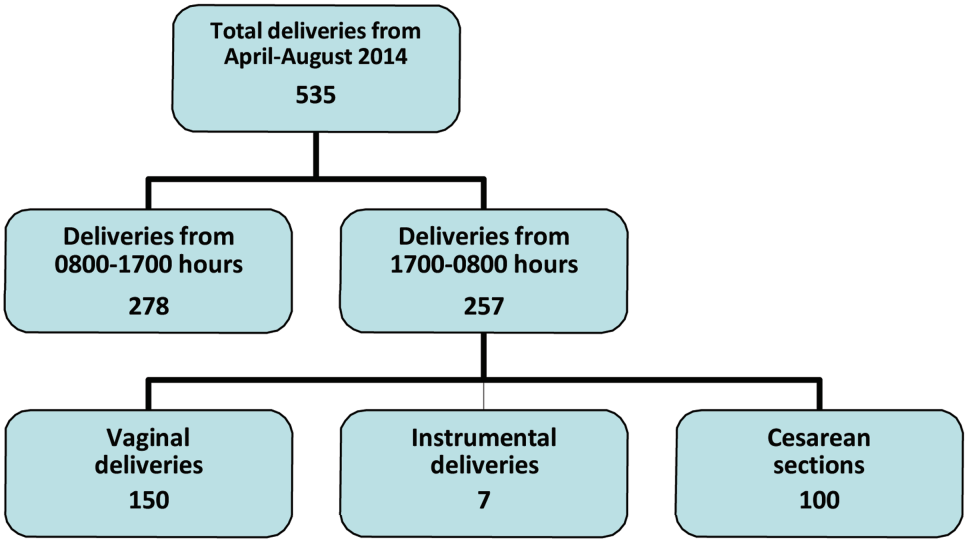

Figure-2: Flow diagram of patients delivered during study duration during 1700-0800 hours.

Group A and B (Figure-2).

The overall mean age was 26.79±5.10 years. The mean age was 26.3±5 years and 27.2±5 years in Group A and B, respectively (p=0.25). There was no significant difference in distribution of primary and multigravida (p=0.77), booked and unbooked cases (p=0.77) and women with co-morbidities (p>0.05).

Gestational age at delivery was 37-42 weeks in 181(90.5%) cases, 34-37 weeks in 17(8.5%) cases and above 37 weeks in 2(1%) cases. Hypertension was observed in 13(6.5%) cases and diabetes in 10(5%) (Table-1).

All pregnant women of both groups delivered live babies with no birth injuries. After implementation of NEWS, none of the patients needed consultancy with specialist or admission to ICU or tertiary care and were managed well at the secondary level. Moreover, 3(3%) patients were referred before implementation due to post-operative complications whereas none was referred after implementation. No maternal deaths were recorded. No significant difference was found in time interval for decision made for emergency CS and action taken (p=0.16). Of all, 13(6.5%) patients had post-partum haemorrhage after CS; they all belonged to Group A (p=0.00). Blood was transfused to only 2(1%) patients, both from Group A (p=0.15).

The overall mean Appearance, Pulse, Grimace, Activity, Respiration (Apgar) score at 1 and 5 minutes of birth was 7.86±0.78 and 9.04±0.46, respectively. The mean score at 1 minute was 7.94±.56 in Group A and 7.77±.95 in Group B (p=0.12), whereas the mean score at 5 minutes was 9.08±.33 and 9.00±.56 (p=0.22), respectively. Moreover, 2(1%) babies were transferred to high level of care; both were from Group B (p=0.49). Besides, 1(50%) of the referred babies expired at the referral centre. This baby belonged to a healthy mother who had no significant history and her NEWS score was 0. The baby's Apgar score

Table-1: Comparing baseline characteristics of patients having caesarean section before and after implementation of NEWS.

Variables	Total Frequency N=200 N (%) Mean±SD	Before NEWS N=100 N (%) Mean±SD	After NEWS N=100 N (%) Mean±SD	p-value
Age (Years)	26.79±5.10	26.38±5.01	27.20±5.18	0.25
Gestational age at delivery (weeks)				
37-42	181(91)	92(92)	89(89)	0.8
34-37	17(8)	7(7)	10(10)	
< 37	2(1)	1(1)	1(1)	
Hypertension				
Yes	13(6.5)	7(7)	6(6)	0.77
No	187(93.5)	93(93)	94(94)	
Diabetes				
Yes	10(5)	6(6)	4(4)	0.51
No	190(95)	94(94)	96(96)	

NEWS: National Early Warning Score
SD: Standard deviation.

Table-2: Comparing maternal and neonatal outcomes of patients having caesarean section before and after implementation of NEWS.

Variables	Total Frequency N=200 N (%) Mean±SD	Before NEWS N=100 N (%) Mean±SD	After NEWS N=100 N (%) Mean±SD	p-value
Decision to delivery Interval				
<30 minutes	16(8)	6(6)	10(10)	
30-60 minutes	111(55)	62(62)	49(49)	0.16
>60 minutes	73(37)	32(32)	41(41)	
Patients transfer to high level of care*				
Yes	1(0.5)	1(1)	0(0)	>0.99
No	199(99.5)	99(99)	100(100)	
Blood transfusion				
Yes	2(1)	2(2)	0(0)	0.15
No	198(99)	98(98)	100(100)	
Babies transfer to high level of care*				
Yes	2(1)	0(0)	2(100)	0.49
No	198(99)	100(100)	98(98)	
APGAR score at 1 minute	7.86±.78	7.94±.56	7.77±.95	0.12
APGAR score at 5 minutes	9.04±.46	9.08±.33	9.00±.56	0.22

*Fisher's exact test
NEWS: National Early Warning Score
Apgar: Appearance, Pulse, Grimace, Activity, Respiration
SD: Standard deviation.

at 5 minutes was 2 and was resuscitated. Later, the baby was referred to tertiary care for ventilator support where he expired (Table-2).

Discussion

The purpose to introduce NEWS was to prompt nurses and junior medical staff to call for experts' help early if patient's health deteriorates. It was not meant to define treatment or demand critical care.[9] In this pilot study, nurses monitored post-operative emergency C-section cases using NEWS and identified patients who needed frequent monitoring and consultation from clinical specialist at an early stage. When we evaluated difference in maternal mortality and morbidity before and after implementation of NEWS, post-partum haemorrhage was significantly different in both groups (p=0.00). Upadhyay and Scholefield reported the importance of early identifying signs of internal bleeding in post-partum women through warning tools[10] and prompt action can prevent any critical condition.[10]

Findings of our study were coherent with the existing literature and confirmed the reduction in unplanned ICU admissions after the use of warning tools.[11] This study did not find difference in mortality among the two groups. Subbe et al. also documented that early warning tools were useful to identify high-risk patients. Their study also could not demonstrate any difference in patient's mortality because it was affected by multiple factors other than patient care measures.[12]

Regular feedback on use of the tool was obtained from nursing staff on a weekly basis. Nurses were the primary users of NEWS in this study and they reported a positive feedback to the use of NEWS for patients. They found it easy to use, and to understand patient condition for further communication if required. They expressed their wish to continue to use it in the future. Similar feedback was reported from nurses and midwifes for early warning tools in literature.[13,14] However, a few studies on maternity units which were led by midwives in developed countries have documented concerns of midwives for implementation of such tools. Reason for concerns were considering this monitoring as an extra work burden because maternal morbidity and mortality was rare in their setting.[15,16]

As it has been mentioned above that in Pakistan maternal morbidity and mortality is high and intensive care facilities are scarce, hence health care providers in our setting found warning tool supportive for patient care.

We used NEWS only for patients with emergency C-section during off working hours as these represented a higher-risk group due to surgical intervention for delivery of baby during the period when specialists are not on routine duty. However, complications can arise even in normal or instrumental delivery cases and therefore it would be appropriate to implement it for improved care provision for all patients.[11]

NEWS is a validated tool to monitor patients for clinical

deterioration and is in use in developed countries. However, its use in obstetric population has been questioned.[8,11] as the physiologic parameters are changed during pregnancy. A modified version of NEWS for obstetric population, named Modified Obstetric Early Warning System (MEOWS),[17] has been designed to address this limitation. MEOWS is now the recommended tool for early identification of critical obstetric patients by CEMACH and it has been in use in all obstetric care health facilities in UK for the past 5 years.[3,15]

One of the limitations of the current study was that we used NEWS on a small sample size and were unable to demonstrate the full impact of the tool. However, feedback that was received from users (mainly nurses) of this tool was coherent with literature and encouraged the use of similar tools in the future for patient care. We would recommend using MEOWS if we continue using any monitoring tool to improve maternal care in our set-up.

Conclusion

NEWS was found to be a practical bedside tool to improve care of patients due to its colour codes to identify patients based on simple monitoring of vital signs. Its structured scoring system guided for the next set of action and also assisted transfer of patient-related information from nurses to doctors or within teams in common language, reducing time taken for urgent clinical decision such as referral. Regular audit of this initiative will allow accumulation of large data sets to influence policymakers to incorporate this in health system at all levels.

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